

Recovery Plan for the

Kemp's Ridley Sea Turtle

Lepidochelys kempii



Department of Commerce

National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE



U.S. Department of the Interior

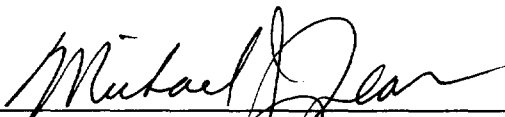
U.S. FISH AND WILDLIFE SERVICE

RECOVERY PLAN
for the
KEMP'S RIDLEY SEA TURTLE
(Lepidochelys kempii)

Prepared by
The Kemp's Ridley Recovery Team

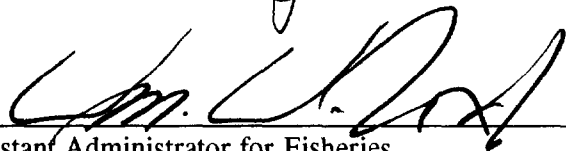
for
Southwest Region
U.S. Fish and Wildlife Service
Albuquerque, New Mexico
and
National Marine Fisheries Service
Washington, D.C.

Approved:



Regional Director, U.S. Fish and Wildlife Service

6/1/92
Date



Assistant Administrator for Fisheries
National Marine Fisheries Service

8-21-92
Date

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. Plans are prepared by the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The Recovery Plan for the Kemp's Ridley Sea Turtle was prepared with the assistance of the Kemp's Ridley Recovery Team. It does not necessarily represent the views of each Recovery Team member, but rather the majority opinion of the Team. Neither does the Recovery Plan necessarily represent the views or the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The Recovery Plan represents the official position of the U.S. Fish and Wildlife Service and National Marine Fisheries Service only after the signature of the Regional Director, Region 2 of the U.S. Fish and Wildlife Service and the Assistant Administrator for Fisheries, National Marine Fisheries Service as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks. Objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

Literature citations should read as follows:

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Preface

The original Recovery Plan for Marine Turtles was approved by the Assistant Administrator for Fisheries, National Marine Fisheries Service, September 19, 1984. The plan included the loggerhead (Caretta caretta), green turtle (Chelonia mydas), hawksbill (Eretmochelys imbricata), leatherback (Dermochelys coriacea), Kemp's ridley (Lepidochelys kempii) and olive ridley (L. olivacea).

The U.S. Fish and Wildlife Service and National Marine Fisheries Service share the responsibility for sea turtle recovery under the authority of the Endangered Species Act of 1973, as amended. Both Services recognized the need to reassess present conservation efforts utilizing the considerable body of new biological information and managerial improvements available since approval of the original recovery plan. To accomplish this, the Services created three separate recovery teams: the Loggerhead/Green Recovery Team; the Leatherback/Hawksbill Recovery Team; and the Kemp's Ridley Recovery Team. The Recovery Teams have each developed plans to provide greater focus and emphasize the uniqueness of individual species. The Recovery Plan for the Kemp's Ridley Sea Turtle was prepared by the Kemp's Ridley Recovery Team comprised of:

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The Recovery Plan incorporates the new standard format described in the "Policy and Guidelines for Planning and Coordinating Recovery of Endangered and Threatened Species" (May, 1990) of the U.S. Fish and Wildlife Service. The Plan is intended to serve as a guide to delineate and schedule those actions believed necessary to restore Kemp's ridley as a viable, self-sustaining element of the ecosystems it inhabits. It is recognized that many of the tasks described in the plan already have been initiated by the governments of Mexico and the United States and other entities.

List of Abbreviations

CITES	Convention on International Trade in Endangered Species
COE	U.S. Army Corps of Engineers
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FWS	U.S. Fish and Wildlife Service
INP	Instituto Nacional de Pesca
GIWW	Gulf Intercoastal Waterway
MARPOL	International Convention for the Prevention of Pollution from Ships
MMS	Minerals Management Service
NGO	Non-Government Organization
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
OOC	Offshore Operators Committee
PAIS	Padre Island National Seashore
PEMEX	Petroleos Mexicanos
SEDUE	Secretaria de Desarrollo Urbano y Ecologia
SEP	Secretaria de Educacion Publica
SEPESCA	Secretaria de Pesca
STSSN	Sea Turtle Stranding and Salvage Network
TED	Turtle Excluder Device
TPWD	Texas Parks and Wildlife Department
USCG	United States Coast Guard
USDI	United States Department of the Interior

Executive Summary

Current status.— Kemp's ridley, Lepidochelys kempii, has received protection in Mexico since the 1960's and was listed as endangered throughout its range December 2, 1970 under United States law. Less than fifty years ago, Kemp's ridley was a very abundant sea turtle in the Gulf of Mexico. The population was able to generate a synchronized reproductive effort of an estimated 40,000 females in one day on the single known nesting beach on the northeastern coast of Mexico (Carr 1963, Hildebrand 1963), and a much larger adult population may have existed. The population crash that occurred between 1947 and the early 1970's may have been the result of both intensive annual harvest of the eggs and mortality of juveniles and adults in trawl fisheries (Magnuson *et al.* 1990). The recovery of the species has been forestalled primarily by incidental mortality in commercial shrimping, preventing adequate recruitment into the breeding population.

Goal.— Because of Kemp's ridleys' aggregated nesting behavior, very restricted breeding range, and increasing threats from the expanding global human population and general environmental degradation, complete recovery (delisting) may not be achievable. Since the principal nesting beach is in Mexico, the continued, long-term cooperation of two nations is necessary to recover the species. The recovery goal of this Plan is to remove the species from Endangered status and downlist to Threatened status. Criteria for delisting will be left to future revisions of the recovery plan.

Recovery criteria.— The criteria we establish for downlisting the species are to:

1. continue complete and active protection of the known nesting habitat, and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continue the bi-national protection project,
2. essentially eliminate mortality from incidental catch in commercial shrimping in the United States and Mexico through use of Turtle Excluder Devices (TEDs) and to achieve full compliance with the regulations requiring TED use,
3. attain a population of at least 10,000 females nesting in a season,
4. successfully implement all priority one recovery tasks.

Actions needed.— The most important actions necessary for recovery are to:

1. assist Mexico to ensure long-term protection of the major nesting beach and its environs, including the protection of the adult breeding stock and enhanced production/survival of hatchling turtles,
2. continue TED regulation enforcement in United States waters, expanding the areas and seasonality of required TED use to reflect the distribution of the species; encourage and assist Mexico to incorporate TEDs in their Gulf of Mexico shrimp fleet,
3. fill in gaps in knowledge that will result in better management. In order to minimize threats and maximize recruitment we should: determine distribution and habitat use for all life stages, determine critical mating/reproductive behaviors and physiology, determine survivorship and recruitment.

Projected cost of recovery.— The cost of recovery is estimated at \$60,000,000. Much of this cost is shared with actions in the recovery plans for the other species of sea turtles.

Date of recovery.— If all recovery tasks are completed, the population increases in accordance with projections and new limiting factors are not encountered, downlisting could be initiated in 2020.

I. Introduction

Taxonomy

Kemp's ridley was first described by Samuel Garman in 1880, as Thalassochelys kempii (or Colpochelys kempii). The sea turtle was named for Richard M. Kemp, a fisherman interested in natural history who submitted the type specimen from Key West, Florida. Later L. kempii was allocated to the genus, Lepidochelys, Fitzinger 1843, by Baur (1890) when it was realized that Kemp's ridley and the Indo-Pacific olive ridley, Lepidochelys olivacea, were congeneric. Several others subsequently considered L. kempii to be a sub-species of L. olivacea, but currently it is recognized as a full species (see below) clearly distinct from Lepidochelys olivacea (Bowen, Meylan and Avise 1991). The latter species is distributed in the Pacific and Indian Oceans and in the southern Atlantic and individuals occasionally reach the southeastern Caribbean (Trinidad, Isla Margarita, Guadeloupe) but are nowhere sympatric with L. kempii, a more northern species in the Atlantic. A taxonomic review of the genus was made by Pritchard (1969a) including a detailed morphological description of the two species, establishing that they have enough morphological differentiation to justify designation as separate full species (Pritchard 1989). This status is accepted by most authors (eg. Márquez 1970,1990, Brongersma 1972, Márquez et al. 1976, 1981, Smith and Smith 1979, Frair 1981, Pritchard and Trebbau 1984, Márquez and Bauchot 1987, Bowen, Meylan and Avise 1991).

Description

Kemp's ridley and its congener, the olive ridley, are the smallest of all extant sea turtles, the weight of an adult generally being less than 45 kg and the straight carapace length around 65 cm. Adult Kemp's ridleys' shells are almost as wide as long. The coloration changes significantly during development from the grey-black dorsum and venter of hatchlings to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are two pairs of prefrontal scales on the head, five vertebral scutes, five pairs of costal scutes and generally twelve pairs of marginals on the carapace. In each bridge adjoining the plastron to the carapace, there are four scutes, each of which is perforated by a pore. This is the external opening of Rathke's gland which secretes a substance of unknown (possibly pheromonal) function. Males are not well described but resemble the females in size and coloration. Secondary sexual characteristics typical of males of sea turtle species are present in L. kempii; i.e., the longer tail, more distal vent, recurved claws and, during breeding, a softened, mid-plastron. The eggs are between 34 and 45 mm in diameter and 24-40 g in weight (Chávez et al. 1968a,b, Márquez 1970,1990, Pritchard and Márquez 1973). Hatchlings generally range from 42-48 mm in straight line carapace length, 32-44 mm in width and 15-20 g in weight (Chávez et al. 1967, Márquez 1972,1990, Fontaine and Caillouet 1985). In 1984 and 1985, NPS (1985) reported hatchlings from the imprinting project had mean carapace lengths (straight-line measurement) of 43.5 and 43.25 mm, respectively (SD=1.67, n=1774 and SD=1.77, n=1692, respectively). Weights also were given. For 1984, hatchlings had a mean weight of 16.37 g (SD=1.26, n=1774) and in 1985, the mean was 15.74 g (SD=1.61, n=1692).

General Biological Characteristics

Diet.-- Neonatal L. kempii presumably feed on the available sargassum and associated infauna or other epipelagic species found in the Gulf of Mexico. In the post-pelagic stages, the ridley is largely cannibalistic (crab eating), with a preference for portunid crabs. From studies of stomach contents, usually of stranded dead turtles, L. kempii appears to be a shallow water, benthic feeder (De Sola and Abrams 1933, Carr 1942, 1952, Smith and List 1950, Liner 1954, Dobie *et al.* 1961, Hardy, Jr. 1962, Montoya 1966, Márquez 1970, Ernst and Barbour 1972, Pritchard and Márquez 1973, Hendrickson 1980, Hildebrand 1982, Mortimer 1981, Lutcavage and Musick 1985). Shaver (1991a) gives a good review of the dietary items consumed by L. kempii in her comparison of the stomach contents of wild and head-started turtles.

Growth.-- Growth data for wild L. kempii are sparse and confounded by imperfectly reproducible measurements, but it is unlikely that most adults grow very much after maturity. Recent work by Zug 1989, suggests juveniles may grow rapidly and that 20 cm ridleys are about two years old. Standora *et al.* (1989) found that five juvenile L. kempii (mean initial size = 31.6 cm) from Long Island, NY, waters had a mean increase in carapace length of about 0.8 cm per month from spring to summer after release following a fall hypothermic event. Head-started ridleys and captive juveniles of the species apparently grow rapidly, as do wild turtles (Fontaine *et al.* 1985). Two individuals of L. kempii at Cayman Turtle Farm fed high protein diets began to lay eggs at five years old and at a much smaller size than seen in the wild. These two examples Wood and Wood (1984) gave were 20 and 24.5 kg with curved carapace lengths (CCL) of 48.3 and 53.3 cm, respectively. Márquez (1970) states the minimum and maximum nesting sizes are 58 cm and 68.5 cm CCL, respectively. Márquez (1972) calculated the age to maturity based on captive growth, recapture data and minimum nesting size as 6-7 years. The Recovery Team feels that this estimate may be too low based on growth rates for other carnivorous cheloniids, namely loggerheads. Frazer and Ehrhart (1985) estimated the age of maturity for loggerheads as 12-30 years and Frazer (1992) recently reported that loggerheads in Queensland, Australia, may not mature until after 35 years.

Reproduction.-- Principal courtship and mating areas for L. kempii are not well known. Anecdotal information supplied by fishermen, revealed that mating presumably occurs at or before the nesting season in the vicinity of the nesting beach (Chávez *et al.* 1967, Pritchard 1969, and Márquez 1970). Shaver (1991b) reported a mating pair of ridleys in Mansfield Channel at the southern boundary of PAIS. Reproduction for the majority of the extant population appears to be annual (Márquez 1982). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, primarily in the Mexican state of Tamaulipas from 23°00' to 23°45' north (Map 1). The mean clutch size during the 14 years of the Kemp's ridley binational project was 100.8 (range 96.5-103.8, std dev=2.5). The hatchlings emerge after 45-58 days, depending upon the incubation conditions, especially temperature. See Pritchard and Márquez (1973) for a complete description of the nesting process.

Movements.-- Movements of the adult females away from the nesting beach have been recorded to both the north and south (Chávez 1969, Pritchard and Márquez 1973, Márquez 1986, 1990, Byles 1988). Byles (1988) also found that post-nesting adult females stayed nearshore in water of 50 meters or less during their movements away from the beach. During the nesting season, Mendonça and Pritchard (1986) found post-nesting females made slow and seemingly random movements offshore near the nesting beach for 1-2 days, then more rapid, longshore movements at least 10 km (and up to 100 km) north or south of their last nesting site before returning to lay eggs again or leaving the

area entirely. They deduced that L. kempii exhibits extensive interesting movements and that there may be some factors grouping turtles nesting on the same day together until the subsequent nesting emergence. Although they postulated that preferred interesting aggregation sites existed adjacent to the nesting beach, small sample size and imprecise positioning did not allow them to clearly map these sites.

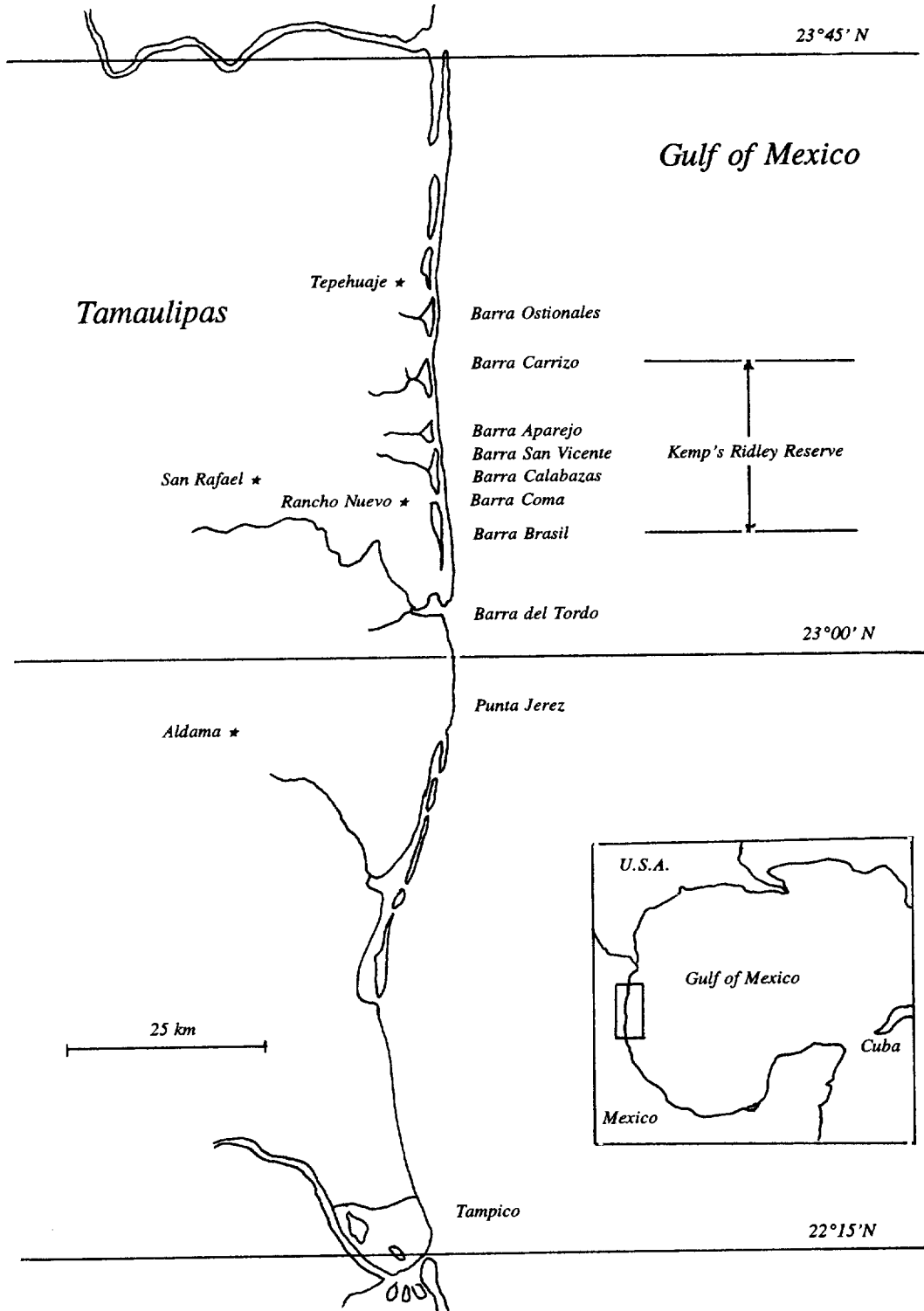
Juvenile/subadult L. kempii have been found along the eastern seaboard of the United States and in the Gulf of Mexico (See Distribution and Habitat). Atlantic juveniles/subadults travel northward with vernal warming to feed in the productive, coastal waters of Georgia through New England, returning southward with the onset of winter to escape the cold (Lutcavage and Musick 1985, Henwood and Ogren 1987, Ogren 1989). In the Gulf, juvenile/subadult ridleys occupy shallow, coastal regions. Ogren (1989) suggested that in the northern Gulf they move offshore to deeper, warmer water during winter. Little is known of the movements of the post-hatching, planktonic stage within the Gulf.

Distribution and Habitat

The major nesting beach where L. kempii emerges in any concentration to lay eggs is on the northeastern coast of Mexico. This location is near Rancho Nuevo in southern Tamaulipas. L. kempii (together with the flatback turtle, Natator depressus, of Australia), has the most restricted distribution of any sea turtle. The species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). There is a single record from Malta in the Mediterranean (Brongersma and Carr 1983), a few from Madeira and the Moroccan coast (Fontaine et al. 1989), and a record from Bermuda (Mowbray and Caldwell 1958). Recently, a juvenile ridley was found in the Azores (Bolten and Martins 1990).

Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the eastern seaboard of the United States. S. Murphy (pers. comm.) reported that a 63.8 cm individual was caught in South Carolina. The post-pelagic stages are commonly found dwelling over crab-rich sandy or muddy bottoms. Juveniles frequent bays, coastal lagoons, and river mouths. Adults are present seasonally near the Mississippi River mouth and the Campeche Banks, converging annually on the Rancho Nuevo nesting grounds (Carr 1963, Pritchard 1969a, Pritchard and Márquez 1973, 1990). What appeared to be winter dormancy (brumation) was observed in Canaveral Channel during seasonally low temperatures (Carr, Ogren and McVea 1980).

Map. Kemp's ridley nesting beach, Tamaulipas, Mexico



Population Status

Less than fifty years ago, Kemp's ridley was an abundant sea turtle in the Gulf of Mexico. Populations were able to generate a synchronized reproductive effort that resulted in an estimated 40,000 females nesting in one day on the single known nesting beach on the northeastern coast of Mexico (Carr 1963, Hildebrand 1963). Such former aggregations could only have been produced by a very large adult population. *L. kempii* has experienced one of the most dramatic declines in population numbers recorded for an animal. Dr. Archie Carr and others sought the nesting areas of Kemp's ridleys throughout the Gulf of Mexico, the Caribbean and Southeast United States over many years (Carr 1963). Sadly, when the Mexican nesting beach was first discovered by scientists in 1961, the population was already severely depleted. That year, Dr. Henry Hildebrand showed an amateur film he obtained in Mexico from Ing. Herrera to a meeting of herpetologists. The film revealed an estimated 40,000 female Kemp's ridleys nesting in an arribada (mass nesting emergence) on one day at Rancho Nuevo (Hildebrand 1963, Carr 1963). On May 23, 1968, the number of turtles nesting in a single arribada had declined to an estimated 5,000 females (Pritchard 1969). In the years 1978-1991, a single arribada rarely reached 200 females (INP-FWS unpubl. data), less than one-half of one percent of a day's nesting in 1947.

Because nearly the entire adult female population nests at a single locality (about 60 km of beach on the east coast of Mexico), it is possible to estimate the female reproductive population by counting all the nests laid at this site. Márquez *et al.* (1982) previously calculated from tag-recapture data that females average 1.5 nests/per season. However, recently Pritchard (1990) deduced 2.31 nests/season/female were likely at the nesting beach. Recent work using ovarian ultrasonography and endocrinology of female Kemp's at Rancho Nuevo led Rostal (1991) to estimate 3.075 nests/female for the 1990 season. The number of nests/female/season has a profound effect on the estimated number of females in the population. Using the older 1.5 figure yields an estimate of 770 females (1155 nests/1.5 nests/female) for the 1991 season. The difference in calculated number of females in the breeding population using an average of Pritchard's and Rostal's figures (about 2.7) results in a 45% reduction compared to using 1.5 nests/season/female. Using 2.7 nests/season/female yields a considerably lower estimate of 428 females in the population that oviposited in 1991. If only 58% of the turtles nest every year (Márquez *et al.* 1982), the total female population would be about 738 individuals. If the number of turtles nesting annually (58%) is underestimated because of unknown tag loss in the population, the number in the nesting population will be overestimated even more and will be less than 738 females.

The estimate excludes males, immature turtles and the small breeding groups or solitary nesters dispersed between Padre Island, Texas and Isla Aguada, Campeche (but the last only if they never nest at Rancho Nuevo). These small nesting groups, solitary females and the number of males (or sex ratio), need to be evaluated quantitatively so that the estimate of total population can be refined to obtain a better assessment of the total adult population in the Gulf of Mexico. Until such data are available, an index of adult female population trends is generated by comparing the number of nests/season laid at the Rancho Nuevo nesting beach (Table 1).

Population estimates of immature *L. kempii* are hard to develop. Increases have been noted in the number of juveniles captured in long-term tagging studies in the northeast Gulf of Mexico (L.O. unpubl. data). If this increase is indicative of an overall increase in the juvenile population, then we should be able to document additional recruitment into the adult population as these turtles mature and if they also escape from shrimp trawls.

The species was listed as endangered by the USDI on December 2, 1970 in the U.S. Federal Register. The endangered status was continued with the status review performed by NMFS in 1985 (NOAA 1985). Internationally, L. kempii is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982). It is listed in Appendix I of CITES.

Table 1. Kemp's ridley Rancho Nuevo project summary (FWS 1991)

YEAR	NESTS PROTECTED*	KNOWN NESTS**	EGGS PROTECTED	HATCHLINGS PRODUCED	% HATCH
1978	834	924	85217	48009	56
1979	954	954	98211	63996	65
1980	796	868	82374	37378	45
1981	897	897	89906	53282	59
1982	750	750	77745	48007	62
1983	746	746	77432	32921	43
1984	798	798	80798	58124	72
1985	677	702	67633	51033	75
1986	675	744	65357	48818	75
1987	714	737	72182	44634	62
1988	830	842	83229	62218	75
1989	826	878	84802	66752	79
1990	973	992	93937	74795	79
1991	1107	1155	107134	75953	71

* nests moved from the site of oviposition for incubation

** includes all known nests; nests protected, nests left in situ and depredated nests

Threats

Historic: It is sometimes tempting to blame natural phenomena for observed declines of wildlife species, and indeed there may be some intrinsic, markedly fluctuating cycles in ridley populations. However, man-induced mortality is to blame for the observed modern decline of the species (Magnuson 1990). Wherever man has gained easy access to large populations of sea turtles, he has tended to over-exploit the resource. The example of the huge Cayman Islands green turtle nesting population, which was totally eliminated (Carr 1968), is one of many which has been documented. Similarly, along the Texas coast, the early settlers soon began to exploit the coastal green turtles with a peak of harvesting between 1890-1892 (Hildebrand 1982, Doughty 1984). There were once turtle canneries at four sites along the Texas coast. By 1915 "the coast had been largely denuded of these edible turtles through thirty or more years of exploitation" (Doughty 1984). While we suspect that this commerce refers primarily to the green turtles, there surely were Kemp's ridleys and loggerheads available for capture along the Texas coast, as well.

Direct exploitation of ridley eggs occurred at the Rancho Nuevo nesting beach in the 1940's through the early 1960's prior to the initiation of protection of the beach in 1966 (Chavez 1967). Prior to the late 1960's, the eggs were taken out in mule trains, by truck and by horseback (Hildebrand 1963). Hildebrand felt that continued exploitation could lead to the demise of the species and he listed anecdotal information as to the disappearance of other arribada beaches to the south of Rancho Nuevo from heavy fishing and egg harvest pressures.

The most important factor affecting the more reproductively valuable, larger juveniles and adults (Crouse, Crowder and Caswell 1987), is the growth of the trawling industry in the Gulf of Mexico. In 1948, just after the Herrera film was made showing 40,000 nesting ridleys, there were fewer than 5000 otter trawls being used along the Gulf coast in the United States. In 1989, there were an estimated 9047 commercial boats under 25 feet in length and 5439 vessels greater than 25 feet in length trawling for shrimp in the Gulf (NOAA 1987). These estimates did not include the many recreational or weekend trawlers, possibly numbering as many as 40,000. Cox and Mauerman (1976) in an unpublished report of a questionnaire survey, indicated that each fishing boat in the 1950's caught 45-55 turtles per year while in the 1960's the turtle catch rate had dropped to 3.48 turtles per boat per year. In the late 1960's and early 1970's, many helpful shrimpers provided extremely valuable information on ridleys originally tagged at Rancho Nuevo by returning the tag numbers from females they caught on the shrimping grounds of Louisiana, Texas and Campeche (Pritchard and Márquez M. 1973, Márquez M., ms.). Currently the catch rate for turtles is low -- fishermen rarely report catching a Kemp's ridley. During World War II, fishing was minimal, and the decline of the large Kemp's ridley population coincided with the build-up of the fishery in the late 1940's and 1950's. It seems probable that intensification of the shrimp fishery in the United States and Mexico with consequent turtle entrainment in trawls was a major cause for the decline of the Kemp's ridley, especially since the high mortality of the reproductive segment of the population in trawls was not offset at all by recruitment in the years following the extensive Mexican harvest of eggs.

Threats: Nesting Environment

Threats to the nesting beach in Mexico are presently few, but potentially serious. Certainly human population growth and increasing developmental pressure will result in escalating threats to the nesting beach. Only the central part of the prime nesting area is protected by Mexican presidential

decree, and legislation has never been enacted to fully implement the decree. A primary concern is human encroachment and access along the entire nesting area. The wording of the Mexican decree is so vague that construction of commercial fishing facilities proceeded in 1987 immediately adjacent to the main turtle camp at Rancho Nuevo. Occasionally, plans for massive expansion of La Pesca (just to the north of the nesting area) as a fishing center, or dredging the GIWW from Brownsville, Texas, to Barra del Tordo (in the south part of the nesting beach) are reported. These plans are alarming because of the assuredly detrimental and possibly disastrous effects that they could have on the nesting environment if they were to be completed.

Other nesting environment threats such as armoring, nourishment, or cleaning of the beach; motorized equipment and non-native dune vegetation do not currently exist. Erosion, nest depredation, and other nest loss agents are not considered problems at present because every nest possible is moved to protected central corrals. At a future date, when increasing numbers of nests necessitate a change in management from corral protection to leaving the nests in situ, these factors will have to be addressed.

A threat that comes about due to management practices at Rancho Nuevo is the problem of concentrating all of the collected nests in corrals. This concentration makes the eggs more susceptible to reduced viability from the manipulation, disease vectors and inundation. The former two do not seem to have been factors over the time of the bi-national project, but inundation was a severe problem in 1980 and 1983, drowning nests and reducing the overall percentage hatch by significant margins (Table 1). Inundation was apparently also a problem in the south camp in 1991 (R.M. pers. obs.)

Threats: Marine Environment

Commercial Fisheries.-- Incidental take by the shrimp industry has been identified as the largest source of mortality (between 500 and 5,000 killed annually) for L. kempii (Magnuson et al. 1990). The trawl fishing effort, both commercial and recreational, in the Gulf of Mexico is intensive (see "Historic" above). Manzella et al. (1988) have estimated from tag returns the relative impact of various types of fishing activity upon juvenile head-started Kemp's ridleys. They concluded that for juveniles caught by fishing, 28% are caught in shrimp trawls, 4% in gill nets, 6% on hook and line, 1% by dip nets, 0.8% by swimmers, 0.2% by beach seines, 0.4% by cast nets, 0.4% by butterfly nets and 0.2% by crab pots. They noted that from the same tag return data, that 34% of the turtles were simply reported as stranded dead or alive and in 26% of the cases no stranding condition was reported. Presumably, some of the mortality and strandings in the last two categories were also fishing-related. Tag returns for adult turtles (Márquez et al. 1987) indicated that 75% were caught in shrimp trawls, 7% in gill nets, 4% in fish trawls, 1% on hook and line, 0.7% by purse seines, 0.7% by beach seines, and 0.7% unknown. These data were based exclusively upon tag returns. Causes of mortality for the larger number of untagged turtles have not been examined.

Restrictions on tow times have been proposed as a means of ensuring the survival of turtles incidentally caught in normal shrimping operations, and as an alternative to use of TEDs. The alternative is not recommended by the Recovery Team, for two main reasons:

1. The duration of forcible submergence necessary to drown a sea turtle is not easily predictable. It depends upon the species, the water temperature, the activity of the turtle, the state of health/stress

of the turtle (that includes stress related to the number of times it has been captured) and the size of the animal. It is probable that Kemp's ridley (especially smaller individuals) in the Gulf of Mexico, being a species of active disposition and found in waters that are relatively warm for much of the year, would drown rapidly. This was indeed demonstrated by the high mortality (in shrimp trawls) of the head-started ridleys released in Copano Bay, Texas, in 1986 (Manzella et. al. 1988). A trawl time short enough to guarantee the survival of ridleys would almost certainly be unacceptable to the industry as the more frequent set and retrieval of nets would restrict fishing time.

Tow time restrictions for shrimp trawlers greater than 25 feet in length and trawling offshore waters was proposed by NMFS as an alternative conservation measure to TEDs. However, after a thorough analysis of the NMFS database on observed trawl mortality versus tow times, it was determined not to be a viable option. The tow time restrictions that were proposed, 90 and 105 minutes, were too long to attain a significant decrease in turtle mortality. In addition, the times were so short as to substantially reduce shrimp catch. Although the relationship between trawl tow time and sea turtle mortality is complex and not clearly established, mortality rates for the proposed tow times were estimated by NMFS to be 50 percent for 90 minutes and 100 percent for 105 minutes for Kemp's ridleys (L.O. unpubl. data). The factors that affect the mortality-tow time relationship are individual size, water temperature, and whether or not to include comatose turtles in the "dead" category. The mortality rate increases rapidly between 45 and 120 minute tow times. Other factors considered but for which correlations were not established are health of the individual, differences between species, season, geographic area, and time of day.

2. Enforcement of a limited tow time is impractical. Much shrimping occurs at night, when observation is difficult. Moreover, in order to make a legal case against a trawler for excessive tow time, the legal maximum tow time would require protracted and continuous observation of individual trawlers. The trawl operators would be unlikely to break the law when they knew they were under observation.

Besides shrimp trawling, other fishing pressures such as pound nets (Lutcavage and Musick 1985), fish trawls (North Carolina prohibited bottom trawl fishing for flounder near Cape Hatteras when dead sea turtles began washing ashore in 1991 and NMFS required emergency conservation measures (Anon 1991) to protect sea turtles), gill nets, hook and line, crab traps and longlines have potential impacts to Kemp's ridleys. Ridleys have been taken in each of the gear types listed above.

Commercial fishing camps are established along the nesting beach at Rancho Nuevo. While the fishing is of a nature not likely to have severe impacts on turtles (small boats, small-mesh gill nets), accidental take of reproductively active adults cannot be ruled out and the proximity of the fishing facilities increases the likelihood of illegal fishing for turtles within the prohibited zone. More importantly, there has been no at-sea enforcement of the fishing ban during the nesting season. Some trawling by Mexican and illegal United States vessels regularly occurs each season within and adjacent to the protected zone.

Marine Pollution and Debris.— The Gulf is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979 and the explosion and destruction of a loaded supertanker, the Mega Borg, near Galveston in 1990). The two primary feeding grounds for adult L. kempji in the northern and southern Gulf of Mexico are both near major areas of near-shore and off-shore oil exploration and production. The nesting beach at Rancho Nuevo is also vulnerable and was indeed affected by the

Ixtoc I oil spill in 1979. The spill reached the nesting beach after the nesting season when adults had returned or were returning to their feeding grounds. It is unknown how the adult turtles using the Bay of Campeche fared. It is possible that high hatchling mortality occurred that year in the open Gulf of Mexico as a result of the floating oil. Physiological impact by oil has been documented in laboratory studies of sea turtles (Vargo *et al.* 1986). In these studies skin alteration, decreased blood glucose and increased white blood cell counts were observed.

The vast amount of floating debris in the Gulf of Mexico constitutes an increasingly serious threat to sea turtles of all ages and species. As Plotkin and Amos (1990) have documented, plastics, monofilament, discarded netting and many other waste items are either eaten by turtles or become death-traps when the turtles become entangled. Ingestion of plastic, rubber, fishing line and hooks, tar, cellophane, rope and string, wax, styrofoam, charcoal, aluminum cans and cigarette filters has occurred in sea turtles (Stanley, Stabenau and Landry 1988). Digestive tract impaction, or toxic absorption are the two major risks to the turtle (Balazs 1984, Lutz pers. comm.). Carr noted (1987) that areas of concentration for pelagic phase young sea turtles are convergence zones which increase the likelihood of ingestion of persistent debris concentrated in these areas as well.

The impact of heavy metals and pesticides on the physiology and behavior of fish and birds is well documented, but very little work has been done on sea turtles. Because Kemp's ridley is a carnivore there is every reason to believe that this species may accumulate such foreign materials. The numerous petro-chemical factories and intensive agriculture along the northern Gulf coast may have major but currently unquantified effects.

The Gulf of Mexico has been proposed as a major ocean dumping and burning site. As of June 6, 1989 the Environmental Protection Agency ruled against using the Gulf for this purpose. The potential negative impacts of this practice (in case it should be reconsidered) with regard to sea turtle biology include the release of PCB's and other such chlorinated hydrocarbons. When these chemicals are burned, a residue in the smoke often moves with the wind and is deposited in the epipelagic zone. Because young sea turtles spend months to years in this zone, apparently associated with natural accumulations of flotsam and algae, they could be vulnerable to surface accumulations. An even more catastrophic impact could occur if a loaded incineration ship were to sink or break up and spill the cargo into the Gulf.

Dredging.-- Dredging operations affect *L. kempii* through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges. The NMFS consulted with the COE in November 1991 and issued a biological opinion under section 7 of the ESA finding that the unrestricted operation of hopper dredges from North Carolina to Cape Canaveral, Florida jeopardized the continued existence of sea turtles, particularly Kemp's ridley. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through spoil dumping, degraded water quality/clarity and altered current flow.

Other.-- Other known or probable man-induced stresses which have yet to be fully quantified include the explosive removal of obsolete oil platforms (Klima *et al.* 1989), impact by the hulls or propellers of boats, power plant entrapment and human activities of various kinds on the foraging grounds (Magnuson *et al.* 1990).

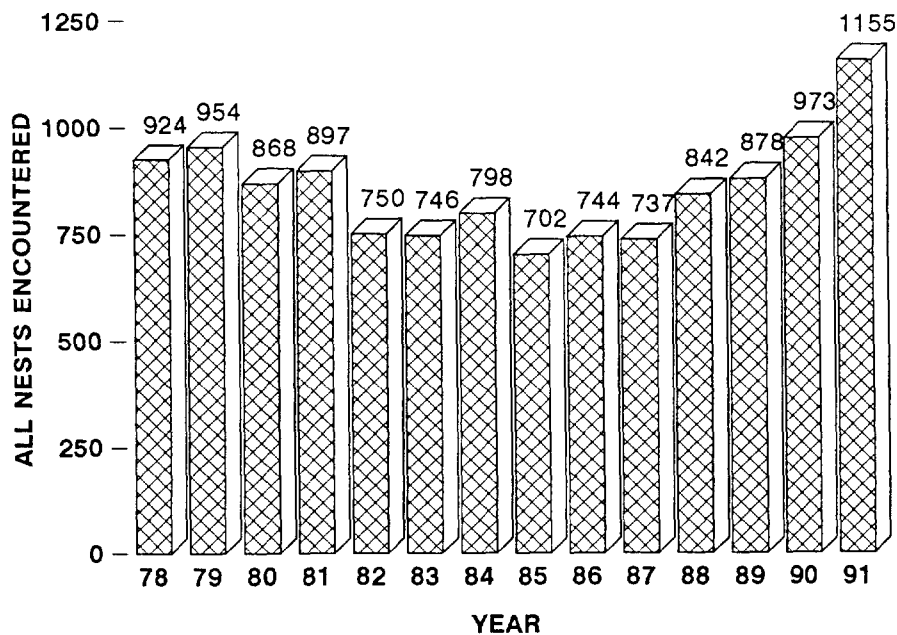
Conservation History

Rancho Nuevo.— Nesting beach protection in the vicinity of Rancho Nuevo has been significantly increased over the past two decades. The collaboration of Mexican and United States conservationists under INP and FWS is now used as a model for an international multi-agency effort. Protection efforts on the Rancho Nuevo nesting beach were initiated in 1966 by the Mexican Government. From 1966-1977, an average of 23,000 hatchlings were released annually (R.M. unpubl. data). From 1978 to the present, under a cooperative beach patrol effort involving both FWS and INP, the number of released hatchlings has been increased to a yearly average of 54,676 individuals (Table 1). For adult females, a downward trend in population numbers continued through 1985, in spite of the efforts since 1966 to stop the egg poaching and harm to the nesting females on the beach. Over one million hatchlings have been released at the nesting beach but have yet to have much effect on recruitment into the adult female portion of the population. There has been an increase in the number of nests documented at Rancho Nuevo since 1985 (Figure 1). The increase is in part due to wider coverage of the nesting beach by the bi-national protection team and in part due to increased numbers of nests laid. How much of the increase is attributable to new recruits to the nesting population versus increased efforts to patrol north and south of the reserve (after a dispersion of nesting females since Hurricane Gilbert altered large expanses of the primary nesting area) is difficult to say (Burchfield et al. 1989). Regardless of the recent apparent increase in nests laid, the view is quite different when all known nests are plotted over time since 1947 (Figure 2). In this perspective, the recent increase is overwhelmed by the decline since 1947 and the numbers of nests seen since 1978 form little more than a horizontal line on the graph.

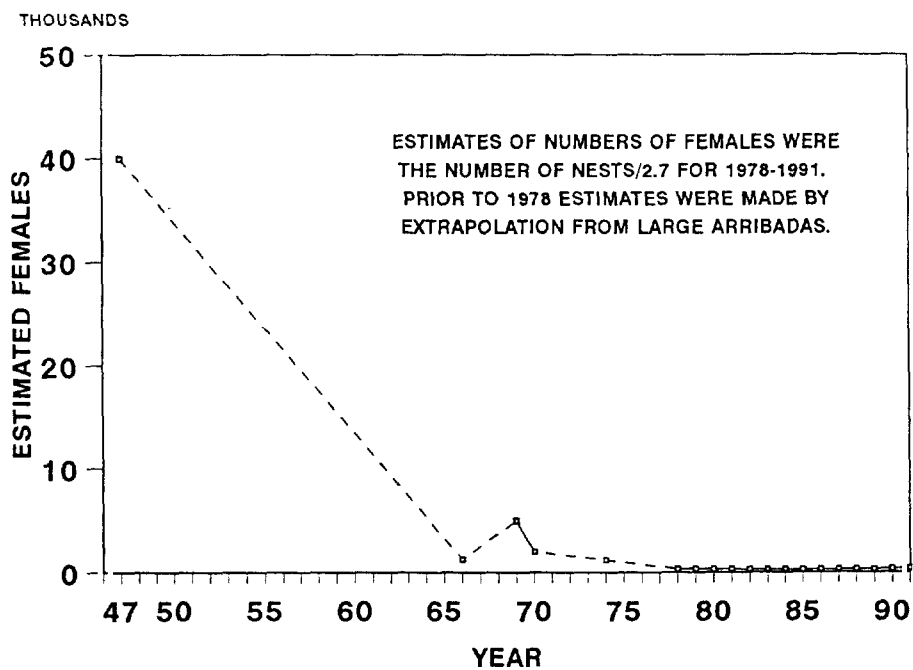
As far as we know, no adult turtle has suffered non-human predation on the beach since 1966 when the Mexican program began. Because of the intensive vigilance of the bi-national protection team, adequate motorized beach patrols and the presence of armed marines, poaching of adult turtles on the nesting beach has not been documented since 1980, and only occasionally is a clutch of eggs taken by humans.

Nearly all nests laid on the beach (Table 1) are moved the same day to fenced and guarded corrals near the camps. Hatching success has been improved in the corrals since the bi-national project began. The mean over the past five years was 72 percent, nearly that of undepredated in situ nests. Almost all of the nests left in situ suffer predation, primarily by coyotes, skunks and raccoons. The few missed nests that are discovered a day or more after being laid and are too old for safe transport to a corral are preferentially protected with plastic mesh in situ and monitored for hatching. Alternatively, if those older nests cannot be protected in situ, they are carefully transferred to a sand-packed styrofoam box for incubation at one of the camps.

**Figure 1. KEMP'S RIDLEY NESTS AT RANCHO NUEVO
FWS/INP DATA 1978-1991**



**Figure 2. KEMP'S RIDLEYS AT RANCHO NUEVO
1947-1991**



(DATA ARE NOT CONTINUOUS FOR EARLY YEARS)

Regulation.-- The species has been afforded some legal protection by Mexico since the 1960's. In 1977, a refuge was established at the only known nesting beach (Anon. 1977) and a Mexican presidential decree included the Rancho Nuevo nesting beach natural reserve as part of a system of reserves for sea turtles (Anon. 1986). On May 28, 1990 a complete ban on taking any species of sea turtle was effected by Mexican presidential decree (Anon. 1990). In addition, the Mexican government (SEDUE and SEPESCA) has proposed a national plan "Programa Nacional de Protección y Conservación de Tortugas Marinas (Propuesta)" which could be a major force, if adopted and implemented, in the protection of all of the remaining sea turtle resources of Mexico (Anon. 1991).

L. kempii has been protected under U. S. law since its listing as a endangered species on December 2, 1970. Protection from international trade has been afforded by CITES under which Kemp's is listed on Appendix I.

Turtle Excluder Devices.-- The progress in the implementation of TED's by the United States shrimp fleet since publication of the regulations requiring TED use in 1987 is the major conservation accomplishment for this century in protecting sea turtles in their foraging and migratory habitat. The importance of TEDs has been well documented (Magnuson et al. 1990). TED trials are currently being conducted in Mexico and requirements for using TEDs aboard the Mexican shrimp fleet will soon be promulgated.

MARPOL.-- This treaty (International Convention for the Prevention of Pollution from Ships) and subsequent regulations by the USCG (Anon. 1988) restrict the discharge of plastics and other garbage into the marine environment. It provides a firm regulatory base that the Recovery Team feels will be significant in reducing debris in the Gulf of Mexico where the major habitat for the Kemp's ridley occurs. A large portion of the debris found washed ashore at the nesting beach, and presumably floating in neonatal/juvenile pelagic habitat is garbage dumped from ships and oil platforms. The regulations prohibit the disposal by all vessels and offshore platforms of all plastics, floating dunnage, paper, rags, glass, metal, bottles, crockery and similar refuse in special areas. At a recent meeting of the International Maritime Organization, it was agreed that the Gulf of Mexico and Caribbean be added as a special area under Annex V of MARPOL in 1992 (CMC 1991).

Habitat research.-- Habitat research now underway promises to provide us with a much improved picture of the biology of this species. Netting studies in the northern Gulf of Mexico (Ogren 1989, A. Rudloe pers. comm.), east coast habitat use and tracking studies (Byles 1989, S. Epperly pers. comm., J. Keinath pers. comm., Standora et al. 1990, M. Renaud pers. comm.), and adult migratory and wintering studies (Byles 1988, R.B. unpubl. data) are continuing. These studies will contribute considerably to our understanding of Kemp's ridley habitat use and requirements and thus to our ability to protect foraging and migratory habitats.

Captive breeding.-- Using head-started turtles that have been retained to adulthood, living hatchlings have been produced, with the most notable success at Cayman Turtle Farm on Grand Cayman Island (Wood and Wood 1980, 1982, 1984). While full reproductive cycles have been completed in captivity, fertility has been quite low. Before captive propagation could be considered a viable conservation technique for sea turtles, many important nutritional, behavioral and physiological questions must be answered. In particular, it must be demonstrated that the offspring of captive turtles are able to join the natural, wild population, find their way to nesting beaches, procreate and hatch viable offspring of their own.

Head-start.— "Head-start" is the term used to describe the process whereby sea turtles are maintained in captivity for a period following hatching, so that the (presumably) very high neonatal mortality may be circumvented. The animals are released when they have outgrown threats from avian and the majority of non-avian predatory species. The Kemp's ridley head-start experiment began in 1978 as part of a complex, bi-national agreement to undertake several conservation and research measures at Rancho Nuevo, PAIS and at the Galveston lab of the NMFS. The head-start experiment was undertaken as a last ditch effort in the face of the alarming decline in turtles nesting at the Rancho Nuevo nesting beach. In 1977, when the project was conceived, protection of the beach lacked manpower and funds, and whether protection would continue was unclear. In fact, the major cause of mortality from man's activities, shrimping, was only then being established and there were no TEDs to eliminate this mortality. Currently, protection of the nesting beach is reasonably secure and TED regulations are in place and being expanded in the U.S. shrimp fleets, while Mexico is embarking on a program of TED placement in their shrimp fleets.

Continuation of the Galveston Kemp's ridley head-start experiment was encouraged by a "Blue Ribbon Panel" (Wibbels et al. 1989), assembled by NMFS to evaluate the progress of the experiment. The Panel's conclusion was that, in order to be fully evaluated, the experiment should continue for 10 years after the complete implementation of TEDs by the Gulf shrimp fleet. The experimental head-start program cannot be considered in this recovery plan as a recovery task. An experiment, by definition, is not a recovery action, and is not necessary for the survival of the species.

As discussed in the National Academy of Science review (Magnuson et al. ,1990), four sequential milestones must be met prior to elevating head-start from an experiment to a proven conservation practice.

1. Growth and survival of head-started turtles in the wild must be established.
2. Nesting [and the Recovery Team would add fertility] of head-started turtles must be documented.
3. Nesting of sufficient head-started turtles to contribute to maintenance and recovery of the population must be demonstrated.
4. Increased likelihood of survival and reproduction of head-started turtle over turtles released as hatchlings must be demonstrated.

Although encouraging results have been reported for 1. above, there is still no evidence that the remaining three milestones are being met. If the head-start program can be shown to contribute significantly to sea turtle population recovery, then it could be included in a revision of this plan. Until that time however, it is important to discourage the proliferation of additional head-start experiments. This will prevent confusion of such experiments with established conservation practices or the substitution of head-start where more appropriate and essential strategies are necessary.

This is not to belittle the achievements made through the head-start experiment. Learning how to rear hatchling turtles in captivity and a wide array of other studies--growth rates, diet, PIT tags, living tags , veterinary research, etc.-- have been conducted at the NMFS Galveston laboratory and will enable us to protect the species better in the future. This program has served as the focus not only for research efforts, but also for public interest, education and support, as manifested by the establishment of organizations such as "Help Endangered Animals Ridley Turtles" (HEART), and the preparation of the excellent popular publication "The Great Ridley Rescue" (Phillips 1989).

Imprinting.-- An important experiment in artificial imprinting was conducted by the joint Mexico-United States Kemp's ridley recovery effort between 1978-1988. In this experiment, an attempt was made to artificially imprint young ridleys using PAIS in Texas as the new imprint site. Because very few ridleys now nest on Padre Island (on average less than one known nest per year), as few as a dozen nests per year could be interpreted as strong support for the imprinting hypothesis. Evidence of marked (by living tag), nesting ridleys using PAIS and not nesting elsewhere would be evidence that eggs/hatchlings could be imprinted upon unfamiliar beaches. NPS has done a commendable job undertaking the difficult patrols seeking this evidence.

Oil Rig Removal Protocol.-- MMS entered consultation with the NMFS under Section 7 of the Endangered Species Act of 1973 concerning the effect of explosive platform removals on sea turtles. The result was that oil and gas companies wishing to use underwater explosives in federal waters are required to submit a permit application to MMS. Included in the permit issued by MMS is an Incidental Take Statement prepared by NMFS describing requirements which must be met to protect sea turtles in the area from potentially harmful effects of the explosions. Among these requirements is the use of qualified observers to monitor sea turtles prior to rig removal. In 1988 NMFS prepared a generic Incidental Take Statement with extensive turtle observation requirements for use on routine removal operations when no single explosive charge exceeds a weight of 50 lb. Similar procedures have been established for structure removals in state waters which fall under the jurisdiction of the COE. Cooperation of the oil and gas industry with MMS, COE and NMFS is continuing.

II. Recovery

A. Recovery Objectives

The goal of this plan is the recovery of the population so that the species can be reduced from Endangered to Threatened status. The Recovery Team members feel that the criteria for complete removal of L. kempji from the endangered species list need not be considered here, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the Marine Mammal Protection Act, be in place and be international in scope. Kemp's ridley can be considered for downlisting to Threatened under the ESA if the following four criteria are met:

1. to continue complete and active protection of the known nesting habitat, and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continue the bi-national protection project,
2. to essentially eliminate mortality from incidental catch in commercial shrimping in the United States and Mexico through use of Turtle Excluder Devices (TEDs) and to achieve full compliance with the regulations requiring TED use,
3. to attain a population of at least 10,000 females nesting in a season,
4. to successfully implement all priority one recovery tasks.

The uncertainties of environmental stochasticity and our lack of knowledge concerning population parameters such as age to sexual maturity, survivorship and natural mortality rates, make it particularly difficult to predict when downlisting may occur. However, we feel that if the funds are available to accomplish the recovery tasks contained in this plan and no new limiting factors become evident, Kemp's ridley could reach a population of 10,000 nesting females in approximately 30 years (by the year 2020) and thus be considered for downlisting.

B. Stepdown Outline and Narrative

1. Protect and manage habitats.

11. Protect and manage nesting habitat.

The primary nesting habitat for L. kempii is in the state of Tamaulipas, Mexico, near the village of Rancho Nuevo, at approximately 23° N latitude. The stretch of beach from just south of Barra del Tordo northward to the town of Tepehuaje, approximately sixty kilometers, encompasses nearly all of the known nesting activity.

111. Encourage Mexico to expand and codify the Kemp's Ridley Natural Reserve at Rancho Nuevo.

1111. Expand the limits of the Kemp's Ridley Natural Reserve at Rancho Nuevo.

The current Rancho Nuevo Natural Reserve boundaries, as defined on the 1986 Decreto de Zonas de Reservas y Sitio de Refugio para la Proteccion, Conservacion, Repoblacion, Desarrollo y Control de las Diversas Especies de Tortugas Marinas (Decreto) should be modified to encompass all of the Kemp's core nesting area. Currently the northern boundary is Barra Carrizo and the southern boundary is Barra Brasil (see Map 1). In 1989 and 1990, a large number of nests were laid outside the Reserve boundaries. About 10 percent of all nests in 1989 were laid north of Barra Carrizo, and some were even encountered north of the town of Tepehuaje. About 20 percent of nests were laid between the southernmost boundary (Barra Brasil) and Barra del Tordo. In 1990, more than 25 percent of all nests were laid north of the reserve. Therefore, the Reserve boundaries should be modified so that at least the area between Barra del Tordo to the south and Barra Soto la Marina to the north are included within the Reserve. In 1990 and 1991, there were green turtle and Kemp's ridley nests south of Barra del Tordo (Burchfield pers. comm.). If this area does have significant Kemp's nesting, then it should be included within the reserve as well.

We suggest that the north-south boundaries of the Kemp's ridley reserve encompass 23°00'N to 23°45'N (approximately 83 km), that it include all of the dune structure, extend landward of the mean low water mark by 1,000 meters and extend seaward for four nautical miles. The protection should be codified in Mexican law. Mexico should be encouraged to promulgate legislation defining the reserve, enabling enforcement and specifying penalties for infractions.

1112. Redefine regulations for better reserve protection.

Two key regulations in the Decreto need to be defined more precisely in order for enforcement to be accomplished. First, the Decreto states that the ecological conditions of the land adjacent to the Reserve (Zona Federal Maritimo Terrestre) should be preserved. However, the dimensions of this adjacent land are not specified. We suggest the dimensions given in

1111. be used. Secondly, the decree does not define what type of human activities could be considered as constituting an ecological stress. We suggest that the Comite Tecnico Consultivo de la Tortuga Marina en el Golfo de Mexico, or other such body, in coordination with universities and non-government conservation groups, could design and present a draft for modifications of the wording of the Decreto for consideration by the SEPESCA and SEDUE, who could then jointly suggest modifications to the President of Mexico.

112. Encourage Mexico to restrict development that may degrade the nesting habitat.

In recent years, both the ejido (a community on land guaranteed to the people by federal land reform) of Rancho Nuevo, and surrounding ejidos have grown in size and economic status. This has naturally resulted in community expansion and increased access to the beach at several points. Mexico (SEDUE) should restrict development and activities near the federal maritime zone that would degrade the habitat. These include, but are not restricted to, the construction of permanent or temporary fishing camps or tourist facilities, the building of new roads that increase access to the beach, grazing by cattle and goats, and the large-scale removal of sand for construction material.

113. Identify additional nesting beaches in Mexico

As with the discovery of increased nesting to the north of the reserve and nesting at Tecolutla and Cabo Rojo (see below), additional, remote beaches in Mexico may have nesting Kemp's ridleys. One method of discovering these beaches would be a concerted aerial survey program during the nesting season combined with ground truth verification. PEMEX (the state-run, national oil company of Mexico) helicopters currently fly many remote beaches from Campeche to Tampico and may be able to alter their flight plans to accommodate trained observers and examine the shoreline enroute. This could be augmented by rented private aircraft where coverage is desired and PEMEX aircraft are not available. As the Kemp's ridley is a very light sea turtle and generally nests on windy days, tracks may be difficult to see from the air and some may be missed. Likely nesting beaches should be visited and interviews with the local people conducted for indications of current or historic nesting.

114. Manage other nesting beaches.

A remote beach at Tecolutla in the state of Veracruz is known to have nesting L. kempii (FWS unpublished data). Since 1987, the protection efforts of a lone SEPESCA fisheries inspector (on foot) have been augmented through a cooperative project by FWS and Universidad de Veracruz using motorized patrols, a crew of university students and workers, and incorporating an extensive local education program. The Tecolutla beach has 20-40 nests per year and some other areas in Mexico may have similar nesting densities. Cabo Rojo, Veracruz is also being investigated for ridley nesting. Every effort should be made to investigate likely areas (item 113 above) and reports of possible ridley nesting to determine the magnitude of nesting and whether

protection can be given to adults, nests and hatchlings. In the aggregate, such ancillary beaches may be very important to population health.

PAIS is presently patrolled by NPS for nesting Kemp's during the summer, but the rest of Padre Island and other areas in Texas are not. NPS should continue patrolling PAIS for nesting ridleys in view of the large number of turtles that were experimentally imprinted there. It would be a terrible waste if the imprinting experiment had worked and we did not know it because of a lack of observations. In addition, efforts should be made to investigate remote areas (eg. Matagorda Island) for signs of nesting, especially beaches where state or federal employees are regularly present and could incorporate patrols in their daily routine or at least occasionally during the nesting season.

12. Protect and manage marine habitat.

Little is known about foraging habitats of neonate, juvenile or adult ridleys. The neonate habitat is pelagic, surficial, largely planktonic and presumably within the Gulf of Mexico. Juveniles and adults are cannibalistic (crab-eating), foraging mostly in the shallow-water coastal zone. Juveniles occupy littoral habitat in the Gulf and along the eastern seaboard of the United States while adults are largely restricted to nearshore areas of the Gulf of Mexico. Habitat degradation has been the result of coastal development, industrialization, river and estuarine pollution, increased vessel traffic, channel construction and maintenance, oil and gas development, and commercial fishing techniques. Identification and protection of essential habitat must be vigorously undertaken.

121. Identify important marine habitat.

Nothing is known about the neonatal "lost years" habitat of L. kempji during the planktonic phase of its existence. Investigations to delineate habitat use during the pelagic phase should be initiated. Developmental habitat for juveniles has been identified in the northern Gulf of Mexico, both coasts of Florida, Georgia, the Carolinas, Chesapeake Bay, Long Island Sound, and Cape Cod. There is no developmental habitat reported from Mexico, although seemingly acceptable habitat with abundant crustaceans exists. Efforts need to be made to further identify habitat essential to the juvenile/subadult ridleys along the east coast of the United States and in the Gulf of Mexico. Adult foraging habitat in the Gulf also needs to be characterized and pinpointed. Broad areas of the Bay of Campeche and the Louisiana coast were reported by Márquez (1986) as areas of the greatest concentrations of tag returns which also had the greatest concentrations of fishing effort. Tag returns may yield an indication of foraging areas or simply turtles passing through fishing zones. Recent studies (Byles 1988, R.B. unpubl. data) have indicated that the western and northern coasts of the Yucatan Peninsula and southern Texas/northern Tamaulipas are important foraging areas for adult females that have left the nesting beach and established true winter residencies.

122. Identify threats to marine habitat.

Dredging, oil and gas exploration and extraction, pollution, fishing gear, and coastal development all potentially degrade habitat. The COE needs to

determine where dredging activities are likely to have adverse impacts on ridley habitat. Oil and gas exploration, extraction and storage have immediate potentially severe effects and unknown, long-term cumulative effects in ridley habitat in the northern Gulf and in the Bay of Campeche. MMS, COE and the industry (largely represented by the OOC) should address possible impacts to ridley habitat from their activities, continue to update and maintain contingency plans for catastrophic accidents. Although the NPDES permitted discharges meet strict toxicity limits, the cumulative effects of long-term, low level discharges and the chronic leaks from the many thousands of active sites in the Gulf are not known. Funding should be provided for long-term studies to assess effects on habitat. Mexico should ensure that PEMEX addresses the impacts in the Bay of Campeche region.

123. Prevent destruction of marine habitat.

Channel dredging alters the bottom and reduces water clarity and quality down-current, from both the dredging operation and the disposal of spoil. Beyond the short term effects of biotic smothering by spoil dumping, or bottom alteration by dredging actions, long term changes in current patterns, sediment transport, suspended load and salinity can severely alter abiotic and biotic environment which comprises ridley habitat. The COE needs to evaluate dredging projects to consider both short- and long-term environmental effects. Oil and gas exploration, rig construction, petroleum extraction and transport all have the potential to damage the habitat from massive oil spills, chronic, low level leaks and spills, and disposal of day to day refuse from rigs and vessels. MMS, EPA and the petroleum industry should continue to take appropriate action to eliminate known sources of pollution, particularly low level spills and leaks. Oil spill response team(s) and equipment should be ready to move at a moment's notice. The delayed response that characterized post-spill actions in recent (1990) Texas spills points out the need for readiness. The petroleum industry supplies and maintains equipment throughout the northern Gulf. The equipment should be maintained in sufficient quantity at strategic locations to enable a quick response. USCG oversight of spill contingency plans and emergency response teams should continue and be strengthened. Assistance should be given Mexico in similar preparedness.

2. Protect and manage populations.

21. Protect and manage populations on nesting beaches.

The fact that nearly all L. kempji nest on one short expanse of beach at Rancho Nuevo makes it imperative that the population arriving annually to nest and the eggs and hatchlings produced there be afforded as complete protection as possible. The current bi-national FWS and INP cooperative effort to manage the major nesting beach at Rancho Nuevo and to provide manpower, vehicles, shelter and materials for beach patrols, nest translocation and monitoring should be continued. In addition, SEDUE should become a participating member of this cooperative effort.

211. Protect nesting females.

Poaching on the nesting beach could constitute a major impediment to recovery. The females are most concentrated and vulnerable while on the nesting beach. Each adult female represents a possible 300 eggs (assuming three completed nests and annual reproduction) or approximately 225 hatchlings (approximately 75% hatch rate) per season over a reproductive life that may span 1-2 decades. The removal of one female near the beginning of her reproductive life may prevent 2,250-4500 hatchlings from entering the population at the lowest rung of the recruitment ladder. From this point of view, 12-24 young females removed from the population could conceivably represent a reduction of progeny over their reproductive life nearly equal to an entire season's reproductive output from all the Rancho Nuevo nesters (mean of 54,676 hatchlings produced per year 1978-1991). Clearly the adult females must be diligently protected if the population is to stabilize and increase. As far as we know, no adult turtle has suffered non-human predation on the beach since 1966 when the Mexican program began. No evidence of human poaching of adult turtles from the beach has been noted since 1979. And the incidence of poaching of eggs has been reduced to near zero in the past decade, thanks to adequate motorized beach patrols and the presence of armed Mexican marines. The nesting beach must be protected each season from the time of the first nesting turtle through the last in order to deter poaching of females or nests.

Currently, the group of Mexican marines (5) stationed at the turtle camp at Rancho Nuevo is sufficient to guard and patrol the central portion of the nesting beach. However, the marines often arrive at the beach after the first turtles nest. The excellent deterrent effect of even the presence of marines is important, and needs to be in place prior to the arrival of any turtles. This means that the biologists and the marines should arrive at Rancho Nuevo prior to or on the first of April each season and not leave before the termination of nesting, usually in July (in actuality, project personnel do not leave before the end of August in order to take care of hatching turtles). Patrols by beach vehicles, eg. All Terrain Vehicles (ATV), should be made a minimum of three or four times per day for high visibility, and special attention should be given to areas distant to the central camp where the deterrent value of the marines is needed. The north camp recently established at Barra Ostionales (near Tepehuaje) should be continued as perhaps twenty-five percent of the total nesting for the 1990 season took place there (P. Burchfield pers. comm.) and poaching has been documented there in recent years. The south camp established near Barra del Tordo has been proven important as well and should also be continued. During arribadas, marines should be stationed at the northern and southern reaches of the nesting beach to prevent possible poaching. Five marines are not sufficient at these times and the Recovery Team feels that ten marines would allow pairs or trios to be stationed at the north and south camps as well as the main contingent in the main camp.

212. Protect nests and increase hatchling production.

To avoid extensive mammal predation and poaching, all nests laid on the beach should, as is current practice, be moved to fenced and guarded corrals near the camps. The operation must be performed as rapidly as possible to avoid heat exposure and desiccation of the eggs, and special care must be taken against undue vibration. When an arribada (over 60 nests) occurs, the coordination of tasks must be rigorous, so while some workers are on the beach recovering nests, others are in the corrals re-burying the eggs. It is very important to build a shelter near the corral receiving the clutches. The clutch should never be placed directly on the hot sand. When nests are discovered that are more than six hours old, we recommend in situ protection through wire caging. If in situ protection is not feasible for such older nests because of threats from poaching (far from the camps) or predation, the clutches must be transported with more caution, avoiding rotation of the eggs or undue vibration because of the increased likelihood of embryonic mortality or damage. All corral nests should be monitored individually in order to track hatching and later identify any problems resulting from handling or other procedures that may adversely affect hatch rate. Care must be taken to clean the corrals thoroughly prior to and during the season to prevent the accumulation of organic debris and proliferation of ghost crabs and ants. Crab-traps in the form of buried, open buckets inside of the corral have been used with success and should be continued. Major infestations of ants may be treated with insecticide but should be used sparingly, in worst-case situations only and never over the nest. When a nest is invaded by ants, it must be cleaned as soon as possible in order to save as much of the clutch as possible. The current practice of covering the corralito over each nest with very fine mesh mosquito netting five days before anticipated hatch has virtually eliminated maggot infestation and should be continued. During drought conditions, the sand becomes very dry, stressing the developing embryos. Watering the nests with well water (not contaminated with salt, chlorine, organic debris, etc.) should alleviate this condition. Contingency plans should be made to loosely cover the nests in the corral with large construction plastic (sheeting) when it rains and the possibility of drowning nests is high.

213. Protect and increase viability of hatchlings.

When hatchlings begin emerging from the nests, the corral must be monitored closely throughout the night to collect the hatchlings before sunrise to release them. Hatchlings should be released as near to the time of emergence as possible, as that is when they are the most active. Hatchling releases should be made on widely separated sections of the beach to avoid predatory fishes and birds becoming accustomed to habitually-used release sites. Care must be taken to avoid releases near open connections between the lagoons and the gulf (bocas) as these areas tend to concentrate predators. During the release care must be taken to avoid ghost crabs. It is best to release the turtles on an area of beach as flat and as clear of debris as possible to facilitate the run to the water. In addition, the corral should be monitored often throughout the day for the occasional daytime emergences so hatchlings will not die from heat, desiccation or bird predation while trapped in the corralitos. Daytime

emerging hatchlings are probably best released after sunset or with the next morning's group. Usually there are small groups ("delayed emergences") remaining in the nests. Such turtles are best exhumed and kept in darkness for an additional day and released with the other groups when their activity levels have increased.

When it is not possible to infer from existing literature or experiments on other species (eg. loggerheads), limited experimentation may be necessary to improve methods of collecting, transporting, reburying and incubating eggs. Such experiments should be performed in a cautious manner and on a small portion of the nests collected. With adequate controls, the results should be clear in one or two seasons (significant increases in the numbers of hatchlings produced). However, it would be prudent to seek a review of the results by the scientific community before employing new techniques on a large scale.

214. Monitor population trends.

The number of females ovipositing at the Rancho Nuevo nesting beach is the best index to the population at large because it is the only major nesting area ever identified and the only place where remnant arribadas still occur. This population should be monitored as thoroughly as possible, including the marking of each nesting female with a unique identifier in order to assess subsequent migrations and nesting efforts. Data are needed on site fidelity, annual/multiannual periodicity, annual fecundity, recruitment and multiannual trends. Tag loss may well be severe, but, as yet, has not been quantifiable. Monel, Inconel, titanium and plastic flipper tags have all been tried, but there are problems with each method.

A promising technology has been applied to the nesting Kemp's in order to counter the problem of tag loss with the standard flipper tags. Since 1988, passive inductive transponder (PIT) tags have been inserted in the flipper musculature of every female encountered nesting. PIT tags are interrogated with a hand-held reader wand that broadcasts a radio frequency which excites the tag to return a pattern that is interpreted as a unique, ten-digit number. Each female is being "read" for the presence of a PIT tag prior to tagging. PIT tags are small (the size of a grain of rice), non-reactive (encapsulated in glass), and estimated to be readable for more than twenty-five years. The use of PIT tags will enable the estimation of recruitment or net loss in the population of nesting females, the number of times during the season a turtle nests and the annual/multiannual reproductive periodicity. In addition, females at points distant to the nesting beach may be identified as having come from the Rancho Nuevo nesting population. We encourage the continued use of PIT tags in addition to the visible traditional tags in order to achieve these ends.

22. Protect population in the marine environment.

In order to recover Kemp's ridley or any sea turtle, we must focus our efforts on determining where they spend their time when not nesting, determine the threats to the turtles at sea and remove those threats. Sea turtles spend more than 99 percent of their lifespan at sea with only brief but very critical ties to the land.

221. Determine distribution and abundance.

2211. Determine habitat use by neonates/pelagic-phase juveniles.

Virtually nothing is known about the abundance and distribution of neonates and pelagic-phase juvenile L. kempij during the "lost-years" of early life when they are presumed to live at the surface of the open Gulf of Mexico. While this work will be logistically difficult, it is very important to know if oceanographic features determine areas of greater abundance or limit distributions of pelagic-phase juveniles to specific current systems (Collard 1987, Collard and Ogren 1990). It is also important to learn how long the pelagic-phase lasts in this and all sea turtle species. A better understanding of this phase of sea turtle life history is necessary for recovery efforts countering the threats from marine debris, toxic concentrations, other pollution and oil spills.

2212. Determine seasonal use of nearshore habitat by juveniles/subadults.

In order to define seasonal distributions, delineate habitat and protect juvenile/subadult ridleys, in-water, live capture studies must be continued and expanded to areas not yet sampled. The current study in Cedar Key, Florida (Ogren 1989, L.O. unpubl. data) is a model for capture work which may be effective in other crab-rich sites. Additional exploratory netting should reveal areas to establish permanent sites for long-term capture and marking studies, such as off the panhandle of Florida (Rudloe et al. 1989), in Florida Bay, Florida, (B. Schroeder pers. comm.) and in Texas (Shaver 1991c).

2213. Determine migratory paths and foraging areas.

Satellite monitoring has proven most effective in elucidating the migratory pathways of adult, female L. kempij. Foraging areas are being revealed slowly, but the expense of the system prevents its use on a large scale. Also, the size of present transmitters limits use on smaller turtles. We feel that high priority should be given to continuing satellite studies on the adults and large subadults in order to determine their migratory paths and foraging areas. As the technology develops (i.e. smaller transmitters) satellite tracking should be applied to juveniles to determine their movements and habitats.

2214. Determine significance of the northeast and mid-Atlantic juveniles.

Juvenile ridleys occur along the United States east coast. To date, evidence of the recruitment of Atlantic juveniles and subadults into the nesting population is lacking. Even so, all indications are that these juveniles can return to the Gulf of Mexico upon maturity and that they

should be treated as an important component of the population. Several studies are underway to determine areas used by these juveniles and their migration patterns. These studies should be continued and expanded with the addition of new tagging technologies (PIT, satellite etc.) and additional study sites.

222. Monitor and reduce mortality from fisheries.

Significant take of ridleys occurs in commercial fisheries. Shrimp trawling contributed to the decline of L. kempii and has remained a major impediment to the recovery of the species (Magnuson et al. 1990). NMFS estimated that approximately 700 Kemp's ridleys were taken annually in the Gulf of Mexico by U.S. shrimpers before TED regulations were in effect. Magnuson et al. (1990) estimated order-of-magnitude mortalities for the period before TED use was required and stated "Shrimp trawling accounts for 5,000 - 50,000 loggerhead and 500 - 5,000 Kemp's ridley mortalities per year." The level of take in the Mexican shrimp fleet is unknown but may also be significant. Capture of ridleys has also been documented for other trawl fisheries, pound nets, gill nets, longlines, and hook and lines (Márquez et al. 1987). The Team members emphasize that incidental take in fisheries is the major cause of the continuing decline of the species in spite of improving beach protection over the past decade.

2221. Enforce TED regulations and expand use.

TED regulations that were implemented in 1989 and 1990 are expected to have the largest positive impact of any recovery activity on the survival of the species. However, TEDs are not required in all areas or at all times where shrimp trawling occurs and L. kempii is likely to occur. One illustrative case is the cessation of the requirement to use TEDs along the Atlantic seaboard at precisely the season that the fall southerly migrations occur. To provide maximum protection for sea turtles, TEDs should be required in all shrimp trawls at all times; TEDs should become as integral to the gear as the trawl doors. Also, the NMFS law enforcement staff should be increased to enforce the regulations.

The States of South Carolina, Florida and Georgia have passed regulations requiring the use of TEDs in their state waters. We recommend that similar regulations be promulgated and enforced at the state level by the other coastal states where shrimping occurs.

New TED regulation enforcement strategies should be implemented which would include state enforcement as well as federal (NMFS, FWS and USCG) agencies.

2222. Define in law and enforce the existing prohibition of trawling within the Rancho Nuevo Reserve.

Enforcement at sea in the maritime portion of the reserve is non-existent and efforts should be made to insure that at least occasional patrols be

made, particularly for shrimp trawlers in the Zona de Reserva during the nesting season. This is even more important if the reserve is expanded to between 23°00'N and 23°45'N, as suggested. Every season working trawlers are observed fishing in the reserve zone or adjacent to it. Some trawlers appear to be United States vessels illegally fishing in Mexican waters (R.B. pers. obs.). Information about the problem confronting the ridleys, the law, and the penalties for fishing in the prohibited zone should be disseminated to shrimpers in Tampico. An end to illegal trawling by United States vessels in Mexico should also be vigorously pursued by both governments.

2223. Encourage and assist Mexico to use TEDs

Members of the Recovery Team are convinced that the implementation of TED technology is important to the welfare of sea turtles wherever shrimping and sea turtles come into conflict. In Mexico and elsewhere there are cultural and practical differences from fisheries in the United States. For example, in Mexico much of the bycatch is not discarded but is used.

The NMFS and Sea Grant programs have developed excellent extension teams to teach and assist local fishermen in the adaptation of TEDs to their particular fishing operations (Magnuson *et al.* 1990). We recommend that the teams already assisting their Mexican counterparts under the mandates of the Fisherman Protection Act continued their efforts.

2224. Maintain the Sea Turtle Stranding and Salvage Network.

The Sea Turtle Stranding and Salvage Network (STSSN) serves several important roles in sea turtle conservation work in the United States. In the first place, the STSSN has been able to document hot spots of negative human/sea turtle interactions. The network will continue to be important as we evaluate the effectiveness of TED and other regulations over the next several years. A second contribution of the STSSN, which is not now adequately utilized, is the basic information on sea turtle biology which can be gained from careful necropsies (Magnuson *et al.* 1990). These efforts need to be expanded. Finally, the network has recovered many tagged animals from other programs and contributed significantly to our understanding of migratory patterns and habitat use.

223. Monitor and reduce impacts from petroleum activities.

There are still significant questions about the interaction of oil drilling and production platforms and Kemp's ridleys. Klima *et al.* (1988) documented a shallow-water rig removal in Texas which may have killed several ridleys, while others have not observed ridleys near rigs (for a review see Magnuson *et al.* 1990). Better documentation of ridleys near oil and gas production facilities, particularly in state-regulated nearshore waters, is important. The negative impacts of direct exposures to oil are only partially known. The MMS has initiated several studies in these areas, and along with the states must

be encouraged to expand their research and amelioration efforts. Mexico should be encouraged to undertake similar studies.

224. Monitor and reduce impacts from dredging activities.

Dredged channels appear to attract sea turtles. The reason for this association is not fully understood. Nevertheless, sea turtles are killed incidental to the dredging activities that are conducted to maintain these channels. The COE is aware of the problem, is under consultation with the NMFS under section 7 of the ESA, and must continue their efforts to minimize the negative impacts on sea turtle populations.

225. Reduce oceanic pollution.

If we can resolve fishing conflicts in the near future, pollution of the Gulf of Mexico may become the most important conservation problem for the Kemp's ridley. This relatively closed system comprises the entire habitat for most of the individuals of the species including probably all of the hatchlings and adults. More research is needed on sublethal effects of pollutants on all age classes of sea turtles. Further identification of sources of pollution are important for all of the Gulf of Mexico. Oceanographic studies are also important in terms of understanding the source and fates of plastics, chemical pollutants and turtle/pollution interactions. The MARPOL treaty should be actively enforced

- 23. Maintain captive stocks.** The Recovery Team recognizes that Kemp's ridley remains a very rare species, and that reasonable protection is very difficult to provide. In view of the multiple natural and man-caused mortality factors still operating in the marine habitat, we see merit in the maintenance of a small number of permanent captive stocks of the species.

Maintaining captive stocks for use as research organisms is compatible with the Endangered Species Act and has served well as a focus for education and public information programs. Because the species is quite rare in the wild, captive individuals may give us many new insights into the biology of these animals. Studies of the reproductive biology, physiology and behavior of Kemp's ridleys can often only be performed in captive conditions rather than in the wild population. It must be emphasized that propagating sea turtles in captivity cannot be substituted for protecting them in the wild and preserving their natural habitat. Under no circumstances can we recommend releasing captive bred turtles into the environment as a trade off for less than complete protection of the Kemp's ridley in its natural environment.

Any young produced by captive stocks should be released to the wild (either as eggs or as hatchlings) or maintained in captivity if deemed appropriate by the permitting agencies (FWS and NMFS).

3. Increase education programs.

Education programs in the United States and Mexico have been developed and instituted by HEART, FWS, NPS, Sea Grant, CMC, SEP, SEDUE, SEPESCA and INP. At the school level, based on the enthusiasm of both students and teachers, these programs appear very worth while. An improved appreciation of man's role in the stewardship of the Gulf of Mexico is essential. At the adult level, conservationists have responded well to educational initiatives, while developers and fishermen have shown a disappointing level of appreciation of the magnitude of the problems and their roles in the solutions. In the United States, new adult education initiatives targeted at those in government and marine industries are still needed. At the same time, many school-age children along the coast have yet to be exposed to the sea turtle situation as a valuable heuristic model for all of conservation.

In Mexico, there is also a need to increase and/or generate popular and official support for the conservation of the Kemp's ridley and essential habitat (the Rancho Nuevo Reserve) through an awareness/education program. Human activities that threaten the Kemp's ridley breeding population and its nesting habitat in the Rancho Nuevo Reserve originate in great part from: 1. a lack of information and awareness of the local people about the importance of protecting the ridley and its habitat, and 2. a lack of adequate information and/or political interest by the decision-makers and politicians whose decisions affect the Kemp's ridley survival and recovery. Therefore, the Recovery Team advises that a long-term comprehensive public awareness and basic education program be developed and integrated into the current bi-national conservation program. The main goal of this program is to generate and/or increase popular and official support for the conservation of the Kemp's ridley and the Natural Reserve. The program should, therefore, be two-pronged: a rural, local education sub-program in and around the Reserve, and a public awareness campaign in the cities, mainly Mexico City, where major political decisions bearing on sea turtle management are made.

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IV. Implementation Schedule

Recovery Task Priorities

We have followed the FWS and NMFS guidelines in developing the recovery tasks and implementation schedule (Anon., 1990, NMFS, 1990). Priority was assigned to the tasks according to the following scale:

RECOVERY TASK PRIORITIES	
PRIORITY 1	An action that must be taken to prevent extinction or to identify those actions necessary to prevent extinction.
PRIORITY 2	An action that must be taken to prevent a significant decline in population numbers, habitat quality, or other significant negative impacts short of extinction.
PRIORITY 3	All other actions necessary to provide for the full recovery of the species.

General Categories for Implementation Schedule

Information Gathering - I or R(earch)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminants
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

IMPLEMENTATION SCHEDULE

FY
1992 1993 1994 1995 1996

GENERAL CATEGORY	PLAN TASK	TASK NUMBER	PRIORITY	TASK DURATION	AGENCIES RESPONSIBLE	CURRENT	FY 2	FY 3	FY 4	FY 5	COMMENTS/NOTES
0-3	Rancho Nuevo reserve expansion, codify in law	1111	1	1 year	SEPESCA, SEDUE	Routine					expand to majority of nesting area
0-3	Redefine and codify regulations	1112	1	1 year	SEPESCA, SEDUE	Routine					+ NGOs/Universities
0-1, 0-2	Restrict development in nesting habitat	112	1	Cont.	SEPESCA, SEDUE	0	25	25	30	30	
I-2	Identify additional nesting beaches: Mexico	113	2	3 years	SEPESCA, SEDUE, FWS	0	50	50	50		+ NGOs/Universities
M-3	Manage other nesting beaches Tecolutla, Padre Island, etc.	114	2	Cont.	SEPESCA, SEDUE, NPS	7	75	75	90	90	+ NGOs/Universities
I-2, I-4	Identify important marine habitat	121	1	10 years	NMFS, STATES, SEPESCA, MMS, NPS, FWS	40	250	250	250	250	+ NGOs/Universities
I-12	Identify threats to marine habitat	122	2	10 years	MMS, NMFS, COE, STATES	100	500	500	500	500	Include physical impact-fishing gear
M-3	Prevent marine habitat destruction	123	2	Cont.	COE, MMS, STATES, NMFS, SEPESCA, PEMEX, SEDUE	100	1M	1M	1M	1M	include petrochem industry
M-5, M-4	Protect nesting females at Rancho Nuevo	211	1	Cont.	SEPESCA, FWS, SEDUE, SECMA	115	150	150	150	150	
M-5, M-1	Protect nests/increase hatchling protection - Rancho Nuevo	212	1	Cont.	SEPESCA, FWS, SEDUE, SECMA	50	50	50	50	50	
R-4	Increase viability of hatchlings - Rancho Nuevo	213	2	Cont.	SEPESCA, FWS, SEDUE						Included in 211 and 212.
I-1	Monitor population trends - Rancho Nuevo	214	1	Cont.	SEPESCA, FWS, SEDUE						Included in 211 and 212.
I-1	Determine habitat use: neonates/pelagic-phase juveniles	2211	2	5 years	NMFS, STATES, SEPESCA, MMS, FWS	50	100	100	100	100	+ NGOs/Universities
I-1	Determine juvenile/subadult nearshore habitat use	2212	1	5 years	NMFS, STATES, SEPESCA, COE, FWS	100	200	200	200	200	+ NGOs/Universities
I-1	Determine migration routes and foraging areas of adults	2213	1	5 years	NMFS, STATES, FWS, SEPESCA	50	300	300	300	300	
I-1	Continue east coast studies	2214	2	5 years	NMFS, STATES, FWS	50	100	100	100	150	+ NGOs/Universities
0-2	Enforce and expand TED regulations	2221	1	Cont.	NMFS, STATES, USCG	500	1M	1M	1M	1M	
0-2	Enforce trawling prohibition near Rancho Nuevo	2222	1	Cont.	SEPESCA, SECMA	50	50	50	50	50	
0-1, M-5	Promote TED use in Mexico	2223	1	10 years	NMFS, FWS, SEA GRANT, SEPESCA	150	250	250	100	100	
I-1, R-1	Maintain sea turtle stranding and salvage network	2224	3	Cont.	NMFS, NPS, SEA GRANT, STATES	100	110	120	130	140	+ NGOS
I-12, M-3	Monitor and reduce impacts of petroleum activities	223	2	Cont.	NMFS, FWS, MMS, STATES, PEMEX, SEPESCA	50	250	250	250	250	
I-2, M-3	Monitor and reduce impacts of dredging activities	224	2	Cont.	COE, NMFS, SEPESCA	100	100	100	100	100	
I-12, M-3	Monitor and reduce impacts of marine pollution	225	2	Cont.	NMFS, MMS, EPA, STATES	0	250	250	250	250	
I-2, 0-1	Address education/awareness and long-term education needs	23	2	Cont.	SEA GRANT, FWS, SEPESCA, SEDUE, NPS	25	100	100	100	100	+ NGOs/Universities
R-7, R-13	Maintain captive stocks	24	3	20 years	SEA GRANT, FWS	50	50	50	50	50	+ NGOs/Universities